1. Identify a target area with uniform reflectance over a multi-pixel area

- 180 X 160m 'grass' site (approx)
  - –rotated 9 degrees off N-S
  - –NW corner:
    - Lat: 44°17'31.12383"N
    - Long: 96°45'59.33636"W
    - Elevation 503 m
  - –Elevation change = 4.89 meters

    Differential GPS values measured by the Stennis GRIT Staff

- Maintenance mowing
  - –6 ft rotary mower (rough, not finish cut) for easternmost 2/3 of site
  - –western 1/3 of site, finish cut

    (target area for high resolution MTF collection)

- To accommodate AWiFS, new markers in unmowed area

June 22, 2005 Brookings, SD 3M field, courtesy of DigitalGlobe

2. During satellite imaging overpass: ground level reflectance measurement

Collection Procedure

- ASD FS FR with 2 meter cable

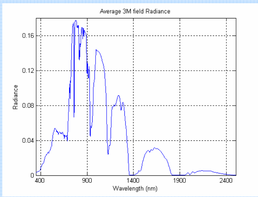
  8 deg optic on pole held 1.5 to 2 m above ground

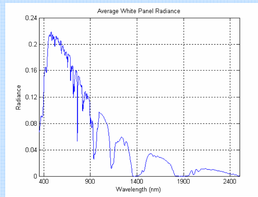
  Nadir view (~25cm diameter sample area)
- Collect while walking ASD along 150 m N-S rows

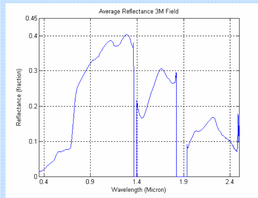
  20 spectra/file, 10 files/save

  Results in 60 files per row so about 600 files per collection

  ~ 20 minutes for 10 row collection
- White reference at end of each row pair (north end)







Data Processing Procedure

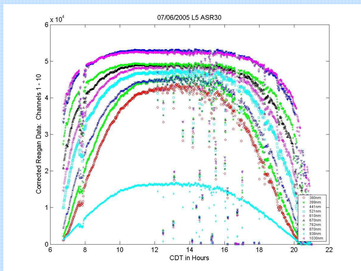
i. BRDF correct white panel data,
ii. Simulate white panel for every grass data collection,
iii. Ratio field data with white panel, correct for sun elevation change, average.

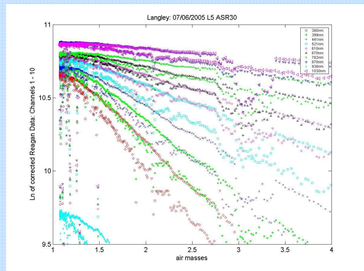
Hyperspectral Data Usage

- Hyperspectral reflectance data used as input data for MODTRAN atmospheric model
- Hyperspectral white panel radiance data used as a model check
- Hyperspectral grass radiance data used as a model check

3. Hours preceding and following overpass: continually monitor select wavelengths for direct and diffuse down welling solar radiance

- Primary tool for this is a 10 Channel ASR unit 30
  - Supplemental tools are the Shadowbands
- Data is collected from sunrise to sunset on the day of overpass
- Data is then cloud filtered as needed

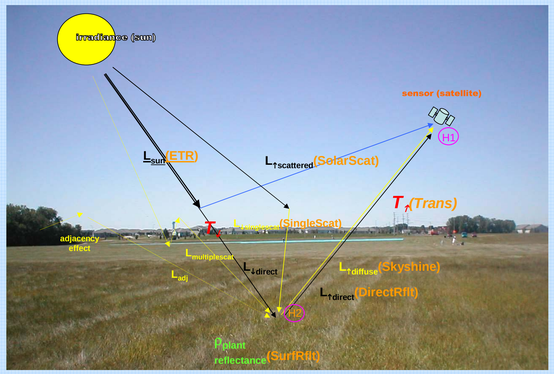




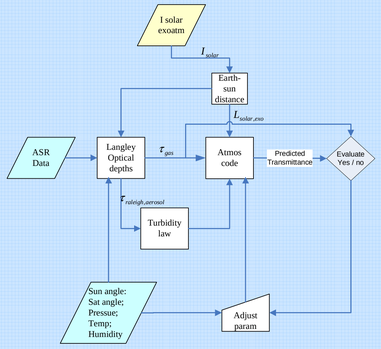
Computation of Modeling Parameters

- Calculate extinction parameters using Langley analysis
- Calculate atmospheric extinction (tau) values

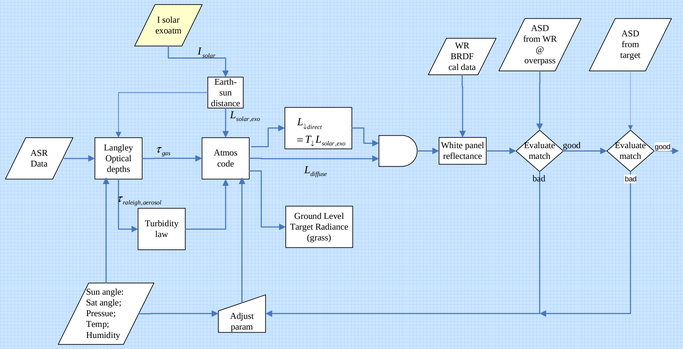
The Atmospheric Modeling Process



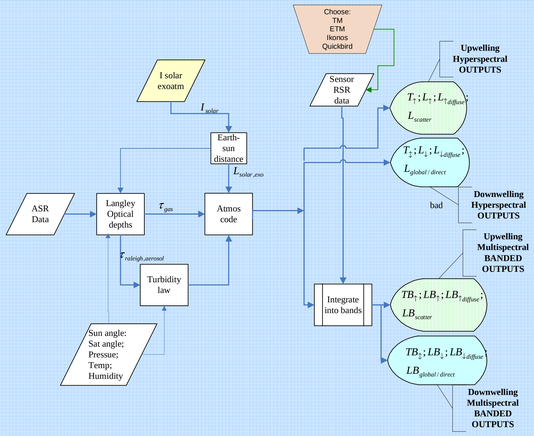
- The basic components that make up the model,

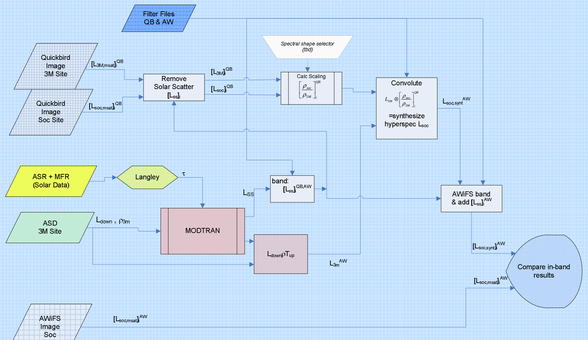
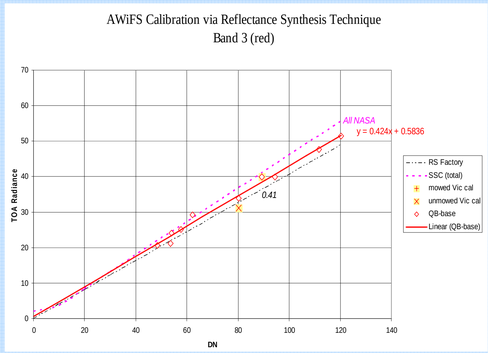


- Set up 1st run of modtran with known measured values, (default fitting values),
- Run model iteratively until the measured transmittance matches the modeled values,



- 2nd run of modtran with known measured values and fitted atmospheric values,
- Compare measured white panel, and grass values to model, adjust models as needed,



- Once model matches all measured values, propagate Top of Canopy radiances thru atmosphere to TOA,
- Band these TOA Hyperspectral radiances to correspond to the satellite sensor,
- Use satellite image DN counts of target area to calculate gain.

Satellite to Satellite Calibration through Ground Spectral Reflectance Synthesis